bed covered with round stones which made walking tiresome if not dangerous. Dr. Abbott and his two animals were soon outdistanced by the two I was endeavoring to follow, and behind him limped our cook, woefully bemoaning the fact that he was "malade de jambes"; and last of all, and practically out of sight, came our guide. Luckily the animals knew the route, otherwise we might never have found Mission.

WASHINGTON, D. C.

Ferns—Facts and Fancies About Them—VI

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Would not some of you like to try the experiment of sowing fern spores and watching the result? It is not at all a difficult thing to do and is very interesting. The spores of hothouse or house ferns may be bought from florists, and those of our native wild plants one can gather. Place any ripe fertile frond in press between white papers, and in a few days, as soon as it is quite dry, if carefully lifted it will leave on the white paper its exact impress composed apparently of fine brown dust, but in reality, as may be easily seen under the microscope, made up of innumerable spores. Spores will start growing upon almost any porous surface where it is moist and warm, as on wet peat or sand, and sporelings are often found on the outsides of flower pots in hothouses. To grow them properly fill a fern or bulb dish half full of broken bits of flower pots or other drainage material. On top of this a thin layer of moss, then about an inch of finely pulverized loam. This should be sterilized by placing the pot for an hour or so in boiling hot water, or by baking it in an oven. Then when cool enough and thoroughly moist but not wet,

sprinkle the spores mixed with a little fine sand or earth very evenly over the surface. Press down gently with a piece of smooth wood. Cover the pot with a piece of glass, set it in a saucer of water and leave it in the dark for several days. It should then be brought into the light but never into sunshine. Also it must never be allowed to get dry, and must not be watered from above, therefore the drops of moisture accumulating on the inside of the glass must be removed every day. In a short time, a few days or it may be weeks according to the species, a fine green scum looking like mildew will appear on the surface, and gradually it will be seen that this is composed of very minute almost microscopic scale-like prothallia. If the spores have been too generously sown, little clumps may be removed on the end of a penknife and planted elsewhere. When the prothallia have reached maturity, if proficient in using a microscope, one may be able to watch the wonderful process of fertilization.

Anyone who has become truly interested in ferns will almost inevitably want to do one or both of two things—start a fern garden, or at least a fern bed, and begin collecting for an herbarium, besides of course having potted ferns in the house. In regard to growing ferns let me quote a sentence I read lately which is very much to the point. "Ferns like most things in nature are sensitive to thoughtful tenderness and repay that consideration which consists, not in expensive outlay, but rather in loving study of a plant's likings and dislikings." Here in a few words are the directions for fern culture. Give the ferns what they need and as they need it and they will amply repay all your care. Shade, moisture, good earth and some stones are surely necessary, but each species has its individual likings just as people have. If a fern naturally grows in a wet rocky

place, it cannot reasonably be expected to thrive if planted in a dry garden bed without even the semblance of a stone under its roots. Nor will a plant whose natural habit is to carry its crown well above the ground be likely to live if buried deep, though other species may need to be treated in that way. Any one lucky enough to own a bit of moist woodland may be able to accomplish wonders with ferns and other native plants. Failing that, however, even a backyard in a city may be coaxed to harbor a few. If you do not know what treatment your plants require, inquire of those who do know. There are many dealers now who raise and sell native hardy ferns who doubtless would willingly help. And then there are books. The late Miss Grace Woolson's "Ferns and how to grow them" is full of practical suggestions.

The best earth for the majority of ferns is a mixture of fibrous loam, sand and peat, or leaf mould. The black woods earth is of course the best, but is not always easy to obtain. Save all the leaves from fruit and lawn trees in autumn, pile them up in a corner, and in a very few months the under ones will have become leaf mould. If conditions are such that the more delicate ferns cannot be arranged for, there are a dozen or more of our handsome common ones which once properly established will do well even under unfavorable conditions. The lady fern, marginal and spinulose shield ferns, the cinnamon and interrupted osmundas are among the best. The ostrich fern also will stand a good deal of sunshine and drought and a well established bed of it mingled with a few wild flowers like field lilies and others is a pretty sight. Under these circumstances, however, it never attains its normal height and beauty. The Christmas fern and the male fern are also very hardy but require more shade than is absolutely necessary for the others. So

also the polypody, bladder fern and of course the brake. Beware where you plant the brake! It is a wanderer, and one can never foresee where new fronds will come up. The rootstocks run deep, and it is difficult to dig up. One summer I found sporeling plants which I brought home and planted, as I thought, well outside of the fern bed, and was much disappointed when they all died down. But the rootstalks were by no means dead. Next spring vigorous fronds came up eight or nine feet away and right in the midst of my most delicate plants. The osmundas it is best to buy if possible. They also, except sporeling plants, are extremely difficult to dig up, as you may judge from an experience of my own. One summer when in the mountains I particularly wanted to take home with me a plant or two of the interrupted fern and was much pleased when I discovered a field of young plants, dozens of them scattered all over it. I decided to take several. But I counted without the osmundas. Not the slightest impression did my trowel make upon any of them. They all seemed to be anchored down to China. The rhizomes also seemed to be all linked together so that walking over the field felt as it might to walk over a huge spring bed. Finally at the very edge of the field I found a small plant which on touching it seemed to be loose. "At last here is one that I can easily dig up," I thought, and attacked it vigorously, only to find myself a moment later lying flat on my back, the handle only of my broken trowel remaining in my hand, while the fern was as firmly rooted as ever. So you see when advised to take an axe and a saw when you go fern digging it is not meant as facetiously as one might imagine.

Be sure to get the cinnamon osmunda. Although this fern grows much taller and is more beautiful in a damp thicket it does very well in a dry partially shaded place and is very attractive in early summer when a dozen or

more tall spikes of bright brown spore cases appear in the midst of a circle of green sterile leaves. It is the most flower-like of the so-called "flowering" ferns. In the mountains this fern sometimes assumes in autumn brilliant orange and brown colors vieing with the maple and sumac in beauty.

Miss Woolson tells us that, contrary to the general opinion, many of our wild ferns make good house plants. Some do well only through the summer and should in autumn be planted in the garden. Others do well almost the year round only requiring an enforced rest for a few weeks in a cool cellar during the winter. I have seen the maiden-hair spleenwort treated in this way and a very attractive pot plant it made. I read once an interesting thing about this plant. Brought from shade into the light and warmth of a living room the fertile fronds were seen to vibrate back and forth for some minutes, stopping occasionally, then starting off again. The ebony spleenwort and the polypody will also do well for a good part of the year, while the cliff brake Miss Woolson calls an ideal house plant. But it should never be turned round in order to have it grow symmetrically. It naturally grows against a rock and as "revolving rocks are not in the natural order of things," as Miss Woolson quaintly puts it, "this plant demands the privilege of standing still."

House ferns bought at a florist's almost invariably require to be changed to a pot one size larger and the earth loosened, as they are apt to be pot-bound, and then to receive a thorough watering. The best way to water ferns and many other plants is to set the pot up to the brim in a tub of water so that the ball of earth about the roots becomes thoroughly wet. Leave not longer than fifteen or twenty minutes. This should be done at least once a week, and ferns should be sprayed or

sprinkled with water once or twice a day. The best time to repot ferns is said to be toward the end of February before new growth begins, but the change may be made any time if care is taken not to disturb the roots. As a rule no water should be left in the saucer in which they stand. To prevent this when a fern pot is kept in an ornamental outer bowl, the bowl should be provided with a double bottom, preferably perforated, and some moss. Some recommend filling the bath tub with steaming water once a week and leaving the plants shut in the room for an hour or so. As we all know, very few plants will flourish in the dry hot air of the ordinary living room, especially if that room is lighted or heated by gas. The holly fern (Cyrtomium) and the Boston fern (Nephrolepis) seem to be the two which stand this abuse the best, though others with care may endure for a while. The best we can do is to remember the fern's greatest needs—frequent change of air, good earth, good drainage, plenty of moisture and to be kept away from draughts.

House ferns grown in too dry an atmosphere are at times subject to the attack of insect pests. Prompt action is necessary to preserve the beauty of the plants and to prevent the insects from spreading. The tiny red spider will succumb to water alone. The green aphis requires confined tobacco fumes. A minute black insect which loves to hide under scales of tomentose stems may be treated with "black leaf 40." Little white worms which sometimes appear in soil which has not been properly sterilized may be killed with lime water or ammonia water. The brown scale which is particularly partial to plants of the hard stemmed varieties must be scraped off, care being taken that none fall on the ground, and then the whole plant should be carefully sponged with whale oil or ivory soap suds, or with kerosene emulsion.

Badly infected fronds should be cut off and burned. Little slugs occasionally appear and these may be trapped under bits of carrot, potato or turnip placed on the ground. Under these they will hide and so can easily be found and destroyed. On two or three occasions some of the ferns in my garden were attacked by green worms or caterpillars which, working on the under part of the frond, first devoured the spores, and then ate holes in the leaf itself before being discovered. They clung tenaciously to the plant and had to be knocked off into a tin of kerosene and the plant sprinkled with hellebore.

CAMBRIDGE, MASS.